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| 10/618,857  | 07/15/2003  | Taekyun Kim          | 033808-004                   | 6991                   |
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|   |             |                      | EXAMINER<br>YUAN, KATHLEEN S |                        |
|   |             |                      | ART UNIT<br>2624             | PAPER NUMBER           |
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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

**Office Action Summary**

Application No.

10/618,857

Applicant(s)

KIM ET AL.

Examiner

Kathleen S. Yuan

Art Unit

2624

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 12 April 2007.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-38 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-38 is/are rejected.
- 7) ☒ Claim(s) 9, 18, 28 and 38 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)                                | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                       | 5) <input type="checkbox"/> Notice of Informal Patent Application                       |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

### **DETAILED ACTION**

The response received on 4/12/2007 has been placed in the file and was considered by the examiner. An action on the merit follows.

#### ***Response to Arguments***

1. The arguments filed on 12 April 2007 have been fully considered. Response to these arguments is provided below.

#### **Summary of Arguments/Amendments:**

2. The applicant has pointed out that the reference's priority does not predate the foreign priority of the application, as indicated by the PCT search report. Therefore, the old rejection is withdrawn.

3. Applicant's arguments filed 4/12/2007, with respect to the rejections of the claims under U.S.C. 102a and U.S.C 103a have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made below.

#### ***Claim Rejections - 35 USC § 112***

4. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Art Unit: 2624

5. Claims 13, 18, 27-28 and 37-28 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

6. Claim 13 recites the limitation "the second GDA transformation unit " in lines 5-6. There is insufficient antecedent basis for this limitation in the claim. The examiner believes that the applicant intends GDA to read LDA, as consistent with the independent claim 10.

7. Claim 18 recites the limitation "the first similar face images" and the "second similar face images in lines 6 and 8, respectively. There is insufficient antecedent basis for this limitation in the claim, since 18 directly depends on claim 10. The examiner believes that the applicant intended to have claim 18 depend on claim 17, to be consistent with the other dependencies, and will be reading the claim as if claim 18 is dependent on claim 17.

8. Claims 27 and 37 recite the limitation "the first similarity determination step" in line 3. There is insufficient antecedent basis for this limitation in the claim.

9. Claims 27 and 37 recite the limitation "the first similar face image extraction step" in line 3. There is insufficient antecedent basis for this limitation in the claim.

10. Claims 27 and 37 recite the limitation "the second similarity determination step" in line 3. There is insufficient antecedent basis for this limitation in the claim.

11. Claims 27 and 37 recite the limitation "the second similar face image extraction step" in line 3. There is insufficient antecedent basis for this limitation in the claim.

***Claim Rejections - 35 USC § 103***

12. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

13. Claims 10, 11, 12, 14, 17, 29, 30, 33, 36 and 37 are rejected under 35 U.S.C. 103(a) as being unpatentable over "Mosaic image method: a local and global method" (Zhao et al) in view in view of Eigenfaces vs. Fisherfaces: Recognition Using Class Specific Linear Projection (Belhumeur et al).

Regarding claim 29, Zhao et al discloses a method comprising the steps of: dividing an input image (for training) into components by dividing an image into small mosaic images (page 3, paragraph 4); PCA transforming the divided facial components into component descriptors of the components by calculating local eigenvectors for the mosaic images (page 3, paragraph 4); synthesizing the transformed component descriptors into a single vector by calculating a global eigenvector (page 3, paragraph 4 and page 4, eq. 4); PCA transforming the single vector into a single face descriptor when trying to recognize an image by finding the projection vector of a new input image (page 4, paragraph 6); and determining similarities between an input query face image and face images stored in a face image DB by comparing a face descriptor of the input query face image with face descriptors of the face images stored in the face image DB by comparing the new image and the models (page 8, paragraph 2).

Art Unit: 2624

Zhao et al does not disclose expressly that the transformation units are LDA, and that the image that is used is a facial image, thus making all the image steps related to a facial image.

Belhumeur et al discloses that it is well known to use PCA and LDA for facial images, disclosing the word "fisherface" for LDA and "eigenface" for PCA (title, page 2, paragraph 2). Belhumeur et al also compares LDA versus PCA, finding LDA is an appropriate method in place of PCA (page 1, paragraph 5-page 2, paragraph 2).

Zhao et al and Belhumeur et al are combinable because they are from the same field of endeavor, i.e. pattern recognition.

At the time of the invention, it would have been obvious to a person of ordinary skill in the art to use LDA instead of PCA and to use recognition for facial recognition.

The suggestion/motivation for doing so would have been a more robust system by providing an optimal method from a discrimination standpoint (page 2, paragraph 1) which provides less errors in cases with lighting variation, facial expression, and presence of glasses (page 8, paragraph 2).

Therefore, it would have been obvious to combine the recognition method of Zhao et al with the facial LDA recognition of Belhumeur to obtain the invention as specified in claim 29.

14. Regarding claim 30, Zhao et al discloses the step of PCA transforming the divided components comprises the steps of: PCA transforming the divided components into component descriptors of the components, transforming them into local eigenvectors (page 3, paragraph 4); and vector normalizing the transformed component

Art Unit: 2624

descriptors into a one-dimensional vector by subtracting the mean and getting the 1 dimensional vector shown in eq. 6 (page 4, paragraph 6). Belhumeur et al discloses the images are facial images (title, page 2, paragraph 2), and using LDA instead of PCA (page 1, paragraph 5-page 2, paragraph 2).

15. Regarding claim 33, Zhao et al discloses comparing of the input query face image with the face images of the image DB, or model images that have been previously processed, is performed by comparing the face descriptor of the input query face image with the face descriptors of the face images stored in the image DB (page 8, paragraph 2).

16. Regarding claim 36, Zhao et al discloses that the step of determining similarities comprises the steps of: extracting first images, a group of model images that were first processed, and second images, a second group of model images that are processed as more model images are input (page 8, paragraph 2); and determining similarities between the input, a third image that is input as the process continues to input faces, a second set of query images and the face images of the image DB using the similarities between the input query face image and the second similar face images since all the images are compared (page 8, paragraph 2). Belhumeur et al discloses the images are facial images (title, page 2, paragraph 2), so therefore, the first images, second images, and input query face are all similar to each other because the images are all of a face.

17. Regarding claim 37, Zhao et al discloses the step of extracting the first and second images comprises: the first similarity determination step of determining similarities between the input query face image and the face images of the image DB,

Art Unit: 2624

the model images (paragraph 8, page 2); the first similar face image extraction step of extracting the first similar face images in an order of similarities according to results of the first similarity determination step by finding the model image that reaches the smallest distance (page 9, paragraph 3); the second similarity determination step of determining similarities between the first similar face images and the face images of the image DB when repeating the process for a new face image (page 8, page 2); and the second similar face image extraction step of extracting the second similar face images for each of the first similar face images in an order of similarities according to results of the second similarity determination step when the repeated process continues (page 8, paragraph 2).

18. Claim 10 is rejected for the same reasons as claim 29. Thus, the arguments analogous to that presented above for claim 29 are equally applicable to claim 10. Claim 10 distinguishes from claim 29 only in that claim 10 is an apparatus claim and claim 29 is a method claim. It is inherent if not obvious that a method must use an apparatus in order to carry out the method. In an apparatus, units that carry out the functions described are the units of each of the steps. Therefore, prior art applies.

19. Claims 11 and 17 are rejected for the same reasons as claims 30 and 36, respectively. Thus, the arguments analogous to that presented above for claims 30 and 36 are equally applicable to claims 11 and 17. Claims 11 and 17 distinguish from claims 30 and 36 only in that they have different dependencies, both of which have been previously rejected. Therefore, prior art applies.



Art Unit: 2624

20. Regarding claim 12, Zhao et al discloses PCA transformation and vector normalization are each provided for the divided components since the full image undergoes transformation and normalization (page 4, paragraph 6). Belhumeur et al discloses the images are facial images (title, page 2, paragraph 2), and using LDA instead of PCA (page 1, paragraph 5-page 2, paragraph 2). In an apparatus, the units that carry out the functions described are the units of each of the steps.

21. Claim 14 is rejected for the same reasons as claim 33. Thus, the arguments analogous to that presented above for claim 33 are equally applicable to claim 14. Claim 14 distinguishes from claim 33 only in that they have different dependencies and claim 14 claims that the image databases stores the descriptors of images. Since the dependencies have been previously rejected, and since Zhao et al discloses that previously processed model images are compared to the input, which therefore must be stored (page 8, paragraph 2), prior art applies.

22. Claims 1, 2, 3, 5, 8, 19, 20, 23, 26 and 27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zhao et al in view of Belhumeur et al as applied to claims 10 and 29 above, and further in view of "Generalized Discriminant Analysis using a Kernel Approach" (Baudat).

Regarding claim 19, Zhao et al (as modified by Belhumeur et al) discloses all of the claimed elements as set forth above and incorporated herein by reference.

Art Unit: 2624

Claim 19 is rejected for the same reasons as claim 29. Thus, the arguments analogous to that presented above for claim 29 are equally applicable to claim 19. Claim 29 distinguishes from claim 19 only in that claim 29 uses GDA instead of LDA.

Zhao et al (as modified by Belhumeur et al) does not disclose expressly using GDA.

Baudat discloses using GDA instead of LDA (page 1, paragraph 1).

Zhao et al (as modified by Belhumeur et al) and Baudat are combinable because they are from the same field of endeavor, i.e. recognition processes using discriminant analysis.

At the time of the invention, it would have been obvious to a person of ordinary skill in the art to use GDA instead of LDA.

The suggestion/motivation for doing so would have been to provide a more robust method for non-linear problems.

Therefore, it would have been obvious to combine the method of Zhao et al (as modified by Belhumeur et al) with Baudat to obtain the invention as specified in claim 19.

23. Claim 1 is rejected for the same reasons as claim 19. Thus, the arguments analogous to that presented above for claim 19 are equally applicable to claim 1. Claim 1 distinguishes from claim 19 only in that claim 1 is an apparatus claim and claim 19 is a method claim. It is inherent if not obvious that a method must use an apparatus in order to carry out the method. In an apparatus, units that carry out the functions described are the units of each of the steps. Therefore, prior art applies.

Art Unit: 2624

24. Claims 2, 3, 5, 8, 20, 23, 26, and 27 are rejected for the same reasons as claims 11, 12, 14, 17, 30, 33, 36, and 37, respectively. Thus, the arguments analogous to that presented above for claims 11, 12, 14, 17, 30, 33, 36, and 37 are equally applicable to claims 2, 3, 5, 8, 20, 23, 26, and 27. Claims 2, 3, 5, 8, 20, 23, 26, and 27 distinguish from claims 11, 12, 14, 17, 30, 33, 36, and 37 only in that they have different dependencies, both of which have been previously rejected. Therefore, prior art applies.

25. Claims 15, 16, 34 and 35 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zhao et al in view of Belhumeur et al, as applied to claims 10 and 29 above, and further in view of "Multiresolution Eigenface-Components" (Kouzani et al).

Regarding claim 15, Zhao et al (as modified by Belhumeur et al) discloses all of the claimed elements as set forth above and incorporated herein by reference.

Zhao et al (as modified by Belhumeur et al) does not disclose expressly the divided face components are partially overlapped with each other.

Kouzani et al discloses a different way of dividing face images, in different features, which partially overlap each other (fig. 2).

Zhao et al (as modified by Belhumeur et al) and Kouzani et al are combinable because they are from the same field of endeavor, i.e. facial recognition.

At the time of the invention, it would have been obvious to a person of ordinary skill in the art to partially overlap the images.

Art Unit: 2624

The suggestion/motivation for doing so would have been to provide a more accurate recognition by providing full information for each feature.

Therefore, it would have been obvious to combine the apparatus of Zhao et al (as modified by Belhumeur et al) with the partial overlapping of Kouzani et al to obtain the invention as specified in claim 15.

26. Regarding claim 16, Kouzani et al discloses that the face components into which the input face image is divided comprises eyes, a nose and a mouth (fig. 2).

27. Claims 34 and 35 are rejected for the same reasons as claims 15 and 16, respectively. Thus, the arguments analogous to that presented above for claims 15 and 16 are equally applicable to claims 34 and 35. Claims 15 and 16 distinguish from claims 34 and 35 only in that they have different dependencies, both of which have been previously rejected. Therefore, prior art applies.

28. Claims 6, 7, 24 and 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zhao et al in view of Belhumeur and Baudat, as applied to claims 1 and 19 above, and further in view of Kouzani et al.

Claims 6, 7, 24 and 25 are rejected for the same reasons as claims 15, 16, 34 and 35, respectively. Thus, the arguments analogous to that presented above for claims 15, 16, 34 and 35 are equally applicable to claims 6, 7, 24 and 25. Claims 15, 16, 34 and 35 distinguish from claims 6, 7, 24 and 25 only in that they have different dependencies, both of which have been previously rejected. Therefore, prior art applies.

Art Unit: 2624

29. Claims 13 and 31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zhao et al in view of Belhumeur et al, and further in view U.S. Patent No. 6567771 (Erdogan et al).

Regarding claim 13, Zhao et al (as modified by Belhumeur et al) discloses all of the claimed elements as set forth above and incorporated herein by reference.

Zhao et al (as modified by Belhumeur et al) does not disclose expressly a transformation matrix/transformation coefficient DB for storing a transformation matrix or transformation coefficients calculated by training the face images stored in the image DB, wherein the first LDA transformation unit or the second LDA transformation unit performs LDA transformation using the stored transformation matrix or transformation coefficients.

Erdogan et al discloses that it is well known that when training a pattern recognition system, during LDA processes, a number of matrices are determined and used to determine a transformation matrix (col. 5, lines 39-47). This must be stored somewhere, in order for use later when the matrix is used to reduce the dimensions of a feature vector (col. 5, lines 47-49). Reducing the feature vector is part of the second LDA process, since it is reducing the feature vector of an input image; thus, the transformation matrix is used in the second LDA process.

Zhao et al (as modified by Belhumeur et al) and Erdogan et al are combinable because they are from the same field of endeavor, i.e. recognition using LDA.

Art Unit: 2624

At the time of the invention, it would have been obvious to a person of ordinary skill in the art to use the transformation matrix.

The suggestion/motivation for doing so would have been to provide the most accurate LDA recognition by being able to find the relationship between the model images and the input image.

Therefore, it would have been obvious to combine Zhao et al (as modified by Belhumeur et al) with the transformation matrix of Erdogan et al to obtain the invention as specified in claim 13.

Regarding claim 31, Erdogan et al discloses that the LDA transforming is carried out using a transformation matrix or a transformation coefficient calculated by training the face images stored in the image DB (col. 5, lines 37-49).

30. Claims 4 and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zhao et al in view of Belhumeur et al and Baudat, and further in view Erdogan et al.

Claims 4 and 21 are rejected for the same reasons as claims 13 and 31, respectively. Thus, the arguments analogous to that presented above for claims 13 and 31 are equally applicable to claims 4 and 21. Claims 4 and 21 distinguish from claims 13 and 31 only in that they have different dependencies, both of which have been previously rejected. Therefore, prior art applies.

31. Claim 32 is rejected under 35 U.S.C. 103(a) as being unpatentable over Zhao et al in view of Belhumeur et al, and further in view of U.S. Patent Application Publication No. 20040066953 (Bock).

Art Unit: 2624

Zhao et al (as modified by Belhumeur et al) discloses all of the claimed elements as set forth above and incorporated herein by reference.

Zhao et al (as modified by Belhumeur et al) does not disclose expressly the step of outputting the face images of the image DB retrieved based on the determined similarities.

Bock discloses outputting face images of the identified face person (page 1, paragraph 0005).

Zhao et al (as modified by Belhumeur et al) and Bock are combinable because they are from the same field of endeavor, i.e. facial recognition.

At the time of the invention, it would have been obvious to a person of ordinary skill in the art to output the recognized face image.

The suggestion/motivation for doing so would have been to provide a more user-friendly system that would allow the information processed to be viewed by someone who wanted to know the result.

Therefore, it would have been obvious to combine Zhao et al (as modified by Belhumeur et al) with the output of Bock to obtain the invention as specified in claim 32.

32. Claim 22 is rejected under 35 U.S.C. 103(a) as being unpatentable over Zhao et al in view of Belhumeur et al and Baudat, and further in view of Bock.

Claim 22 is rejected for the same reasons as claim 32. Thus, the arguments analogous to that presented above for claim 32 are equally applicable to claim 22.

Art Unit: 2624

Claim 22 distinguishes from claim 32 only in that they have different dependencies, both of which have been previously rejected. Therefore, prior art applies.

***Allowable Subject Matter***

33. Claims 9, 18, 28 and 38 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

34. Claims 9, 18, 28 and 38 would be allowable if rewritten to overcome the rejection(s) under 35 U.S.C. 112, 2nd paragraph, set forth in this Office action and to include all of the limitations of the base claim and any intervening claims.

35. Claims 9, 18, 28 and 38 are allowable because of the reasoning disclosed in the previous office action.

***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kathleen S. Yuan whose telephone number is (571)272-2902. The examiner can normally be reached on Monday to Thursdays, 9 AM to 5 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Joseph Mancuso can be reached on (571)272-7695. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.



Art Unit: 2624

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KY  
6/3/2007



JOSEPH MANCUSO  
SUPERVISORY PATENT EXAMINER